CLAIMS

1. A method for use in improving reliability and communication quality in a cellular radio communication system (1) which includes at least a first radio base station (RBS1) having associated radio channels with uplinks and downlinks using different carrier frequencies, the method **characterised** by comprising:

determining whether one of a first uplink (25) or a first downlink (27) of a first radio channel (23) is subject to a Rayleigh fading dip, the first radio channel (23) being used during a current communication segment for communications between the first radio base station (RBS1) and a first radio terminal (T1); and

determining whether to execute a countermeasure in order to counteract the negative influences of Rayleigh fading, if it is determined that one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip.

2. A method according to claim 1, wherein the determining of whether one of the first uplink or the first downlink is subject to a Rayleigh fading dip includes:

obtaining a gain of the first uplink (25);

obtaining a gain of the first downlink (27); and

comparing the gain of the first uplink (25) to the gain of the first downlink (27) in order to deduce whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip.

3. A method according to claim 2, wherein the comparing includes:

determining an offset (F) associated with a difference between the gain of the first uplink (25) and the gain of the first downlink (27) during the current communication segment; and

determining whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip by monitoring how the difference between the gain of the first uplink (25) and the gain the first downlink (27) deviates from the offset (F).

4. A method according to claim 3, wherein the determining of the offset (F) includes determining the offset (F) by establishing an average value of the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during the current communication segment.

5. A method according to claim 4, wherein the method further comprises:

generating an initiation value for use as a starting point when establishing the average value in order to reduce a convergence time of the establishing of the average value.

6. A method according to claim 5, wherein the generating of the initiation value includes generating the initiation value (F1) by averaging the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during all communications performed over the first radio channel (23) from a selected point in time which precedes the current communication segment.

7. A method according to claim 5, wherein the generating of the initiation value includes generating the initiation value (F11) by averaging the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during communications performed over the first radio channel (23) between the first radio base station (RBS1) and radio terminals of the same type as the first radio terminal (T1).

8. A method according to any one of the claims 3 to 7, wherein the monitoring includes determining that the first downlink (27) is subject to a Rayleigh fading dip, if the difference between the gain of the first uplink (25) and the gain of the first downlink (27) exceeds the offset (F) by more than a first predetermined value.

9. A method according to any one of the claims 3 to 8, wherein the monitoring includes determining that the first uplink (25) is subject to a Rayleigh fading dip, if the difference between the gain of the first uplink (25) and the gain of the first downlink (27) falls below the offset (F) by more than a second predetermined value.

10. A method according to claim 1, wherein the determining of whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip includes:

obtaining a quality estimate (Q1) of the first uplink (25);

determining in dependence of the quality estimate (Q1) of the first uplink (25) whether the communication quality of the first uplink (25) is acceptable;

obtaining a measurement of a first downlink signal strength (SS2) received by the first radio terminal (T1);

determining in dependence of the measured first downlink signal strength (SS2) whether the first downlink signal strength is acceptable; and

determining that the first uplink (25) is subject to a Rayleigh fading dip, if the communication quality of the first uplink (25) is not acceptable and the first downlink signal strength (SS2) is acceptable.

11. A method according any one of claims 1 or 10, wherein the determining of whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip includes:

obtaining a quality estimate (Q2) of the first downlink (27);

determining in dependence of the quality estimate (Q2) of the first downlink (27) whether the communication quality of the first downlink (27) is acceptable;

obtaining a measurement of a first uplink signal strength (SS1) received by the first radio base station (RBS1);

determining in dependence of the measured first uplink signal strength (SS1) whether the first uplink signal strength is acceptable; and

determining that the first downlink (27) is subject to a Rayleigh fading dip, if the communication quality of the first downlink (27) is not acceptable and the first uplink signal strength (SS1) is acceptable.

12. A method according any one of the claims 1 to 9, wherein the determining of whether to execute the countermeasure includes:

obtaining a quality estimate (Q1) of the first uplink (25);

determining in dependence of the quality estimate (Q1) of the first uplink (25) whether a communication quality of the first uplink (25) is acceptable; and

determining to execute the countermeasure, if the first uplink (25) is subject to a Rayleigh fading dip and the communication quality of the first uplink (25) is not acceptable.

13. A method according any one of the claims 1 to 9, or 12, wherein the determining of whether to execute the countermeasure includes:

obtaining a quality estimate (Q2) of the first downlink (27);

determining in dependence of the quality estimate (Q2) of the first downlink (27) whether a communication quality of the first downlink (27) is acceptable; and

determining to execute the countermeasure, if the first downlink (27) is subject to a Rayleigh fading dip and the communication quality of the first downlink (27) is not acceptable.

14. A method according to any one of the claims 1 to 9, or 13, wherein the determining of whether to execute the countermeasure includes:

obtaining a quality estimate (Q1) of the first uplink (25);

determining in dependence of the quality estimate (Q1) of the first uplink (25) whether a communication quality of the first uplink (25) is acceptable;

determining when information is sent over the first uplink (25); and

determining to execute the countermeasure, if information is sent over the first uplink (25) while the first uplink (25) is subject to a Rayleigh fading dip and the communication quality of the first uplink (25) is not acceptable.

15. A method according to any one of the claims 1 to 9, 12 or 14, wherein the determining of whether to execute the countermeasure includes:

obtaining a quality estimate (Q2) of the first downlink (27);

determining in dependence of the quality estimate (Q2) of the first downlink (27) whether a communication quality of the first downlink (27) is acceptable;

determining when information is sent over the first downlink (27); and

determining to execute the countermeasure, if information is sent over the first downlink (27) while the first downlink (27) is subject to a Rayleigh fading dip and the communication quality of the first downlink (27) is not acceptable.

16. A method according to any one of the claims 1, 10 or 11, wherein the determining whether to execute the countermeasure includes determining to execute the countermeasure, if it is determined that the first uplink (25) is subject to a Rayleigh fading dip.

17. A method according any one of the claims 1, 10, 11 or 16, wherein the determining whether to execute the countermeasure includes determining to execute the countermeasure, if it is determined that the first downlink (27) is subject to a Rayleigh fading dip.

18. A method according to any one of the claims 1 to 17, wherein the determining whether to execute the countermeasure includes determining whether to perform a handoff from the first radio channel (23).

19. A method according claim 18, wherein the method further comprises:

selecting a new channel to which handoff is to be performed, if it is determined to perform a handoff from the first radio channel (23); and

performing handoff from the first radio channel (23) to the new channel.

20. A method according to claim 19, wherein the selecting includes:

determining a set of channels which are available for handoff; and

selecting the new channel from the set of channels.

21. A method according to claim 20, wherein the determining of the set of channels includes determining the set of channels to include at least one channel associated with the first radio base station (RBS1).

22. A method according to any one of the claims 20 or 21, wherein the cellular radio communication system includes at least a second radio base station having essentially the same location as the first radio base station, and wherein the determining of the set of channels includes determining the set of channels to include at least one channel associated with the second radio base station.

23. A method according to any one of the claims 20, 21 or 22, wherein the selecting of the new channel from the set of channels includes, if the first uplink (25) is subject to a Rayleigh fading dip, selecting from the set of channels the channel having an uplink using a carrier frequency which differs the most from the carrier frequency of the first uplink (25) without being essentially an integer multiple of the carrier frequency of the first uplink (25).

24. A method according any one of the claims 20, 21 or 22, wherein the selecting of the new channel from the set of channels includes, if the first downlink (27) is subject to a Rayleigh fading dip, selecting from the set of channels the channel having a downlink using a carrier frequency which differs the most from the carrier frequency of the first downlink (27) without being essentially an integer multiple of the carrier frequency of the first downlink (27).

25. A method according to any one of the claims 1 to 17, wherein the determining of whether to execute the countermeasure includes determining whether to switch a transmitting antenna (11a,11b).

26. A method for determining whether one of a first uplink (25) or first downlink (27) of a first radio channel (23) is subject to a Rayleigh fading dip, the first radio channel (23) being

used during a current communication segment for communications between a first radio base station (RBS1) and a first radio terminal (T1), the method **characterised** by comprising:

obtaining a gain of the first uplink (25);

obtaining a gain of the first downlink (27); and

comparing the gain of the first uplink (25) to the gain of the first downlink (27) in order to deduce whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip.

27. A method according to claim 26, wherein the comparing includes:

determining an offset (F) associated with a difference between the gain of the first uplink (25) and the gain of the first downlink (27) during the current communication segment; and

determining whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip by monitoring how the difference between the gain of the first uplink (25) and the gain the first downlink (27) deviates from the offset (F).

28. A method according to claim 27, wherein the determining of the offset (F) includes determining the offset (F) by establishing an average value of the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during the current communication segment.

29. A method according to claim 28, wherein the method further comprises:

generating an initiation value for use as a starting point when establishing the average value in order to reduce a convergence time of the establishing of the average value.

30. A method according to claim 29, wherein the generating of the initiation value includes generating the initiation value (F1) by averaging the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during all communications performed over the first radio channel (23) from a selected point in time which precedes the current communication segment.

31. A method according to claim 29, wherein the generating of the initiation value includes generating the initiation value (F11) by averaging the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during communications performed over the first radio channel (23) between the first radio base station (RBS1) and radio terminals of the same type as the first radio terminal (T1).

32. A method according to any one of claims 27 to 31, wherein the monitoring includes:

determining that the first downlink (27) is subject to a Rayleigh fading dip, if the difference between the gain of the first uplink (25) and the gain of the first downlink (27) exceeds the offset (F) by more than a first predetermined value; and

determining that the first uplink (25) is subject to a Rayleigh fading dip, if the difference between the gain of the first uplink (25) and the gain of the first downlink (27) falls below the offset (F) by more than a second predetermined value.

33. An apparatus for use in improving reliability and communication quality in a cellular radio communication system (1) which includes at least a first radio base station (RBS1) having associated radio channels with uplinks and downlinks using different carrier frequencies, the apparatus **characterised** in that it comprises:

means for determining whether one of a first uplink (25) or a first downlink (27) of a first radio channel (23) is subject to a Rayleigh fading dip, the first radio channel (23) being used during a current communication segment for communications between the first radio base station (RBS1) and a first radio terminal (T1); and

means for determining whether to execute a countermeasure in order to counteract the negative influences of Rayleigh fading, if it is determined that one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip.

34. An apparatus according to claim 33, wherein the means for determining of whether one of the first uplink or the first downlink is subject to a Rayleigh fading dip includes:

means for obtaining a gain of the first uplink (25);

means for obtaining a gain of the first downlink (27); and

means for comparing the gain of the first uplink (25) to the gain of the first downlink (27) in order to deduce whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip.

35. An apparatus according to claim 34, wherein the means for comparing includes:

means for determining an offset (F) associated with a difference between the gain of the first uplink (25) and the gain of the first downlink (27) during the current communication segment; and

means for monitoring how the difference between the gain of the first uplink (25) and the gain the first downlink (27) deviates from the offset (F).

36. An apparatus according to claim 35, wherein the means for determining the offset (F) includes means for determining the offset (F) by establishing an average value of the difference

between the gain of the first uplink (25) and the gain of the first downlink (27) during the current communication segment.

37. An apparatus according to claim 36, wherein the apparatus further comprises:

means for generating an initiation value for use as a starting point when establishing the average value in order to reduce a convergence time of the establishing of the average value.

38. An apparatus according to claim 37, wherein the means for generating the initiation value includes means for generating the initiation value (F1) by averaging the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during all communications performed over the first radio channel (23) from a selected point in time which precedes the current communication segment.

39. An apparatus according to claim 37, wherein the means for generating the initiation value includes means for generating the initiation value (F11) by averaging the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during communications performed over the first radio channel (23) between the first radio base station (RBS1) and radio terminals of the same type as the first radio terminal (T1).

40. An apparatus according to any one of the claims 35 to 39, wherein the means for monitoring includes means for determining that the first downlink (27) is subject to a Rayleigh fading dip, if the difference between the gain of the first uplink (25) and the gain of the first downlink (27) exceeds the offset (F) by more than a first predetermined value.

41. An apparatus according to any one of the claims 35 to 40, wherein the means for monitoring includes means for determining that the first uplink (25) is subject to a Rayleigh fading dip, if the difference between the gain of the first uplink (25) and the gain of the first downlink (27) falls below the offset (F) by more than a second predetermined value.

42. An apparatus according to claim 33, wherein the means for determining whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip includes:

means for obtaining a quality estimate (Q1) of the first uplink (25);

means for determining in dependence of the quality estimate (Q1) of the first uplink (25) whether the communication quality of the first uplink (25) is acceptable;

means for obtaining a measurement of a first downlink signal strength (SS2) received by the first radio terminal (T1);

means for determining in dependence of the measured first downlink signal strength (SS2) whether the first downlink signal strength is acceptable; and

means for determining that the first uplink (25) is subject to a Rayleigh fading dip, if the communication quality of the first uplink (25) is not acceptable and the first downlink signal strength (SS2) is acceptable.

43. An apparatus according any one of claims 33 or 42, wherein the means for determining whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip includes:

means for obtaining a quality estimate (Q2) of the first downlink (27);

means for determining in dependence of the quality estimate (Q2) of the first downlink (27) whether the communication quality of the first downlink (27) is acceptable;

means for obtaining a measurement of a first uplink signal strength (SS1) received by the first radio base station (RBS1);

means for determining in dependence of the measured first uplink signal strength (SS1) whether the first uplink signal strength is acceptable; and

means for determining that the first downlink (27) is subject to a Rayleigh fading dip, if the communication quality of the first downlink (27) is not acceptable and the first uplink signal strength (SS1) is acceptable.

44. An apparatus according any one of the claims 33 to 41, wherein the means for determining whether to execute the countermeasure includes:

means for obtaining a quality estimate (Q1) of the first uplink (25);

means for determining in dependence of the quality estimate (Q1) of the first uplink (25) whether a communication quality of the first uplink (25) is acceptable; and

means for determining to execute the countermeasure, if the first uplink (25) is subject to a Rayleigh fading dip and the communication quality of the first uplink (25) is not acceptable.

45. A method according any one of the claims 33 to 41, or 44, wherein the means for determining of whether to execute the countermeasure includes:

means for obtaining a quality estimate (Q2) of the first downlink (27);

means for determining in dependence of the quality estimate (Q2) of the first downlink (27) whether a communication quality of the first downlink (27) is acceptable; and

means for determining to execute the countermeasure, if the first downlink (27) is subject to a Rayleigh fading dip and the communication quality of the first downlink (27) is not acceptable.

46. An apparatus according to any one of the claims 33 to 41, or 45, wherein the means for determining whether to execute the countermeasure includes:

means for obtaining a quality estimate (Q1) of the first uplink (25);

means for determining in dependence of the quality estimate (Q1) of the first uplink (25) whether a communication quality of the first uplink (25) is acceptable;

means for determining when information is sent over the first uplink (25); and

means for determining to execute the countermeasure, if information is sent over the first uplink (25) while the first uplink (25) is subject to a Rayleigh fading dip and the communication quality of the first uplink (25) is not acceptable.

47. An apparatus according to any one of the claims 33 to 41, 44 or 46, wherein the means for determining whether to execute the countermeasure includes:

means for obtaining a quality estimate (Q2) of the first downlink (27);

means for determining in dependence of the quality estimate (Q2) of the first downlink (27) whether a communication quality of the first downlink (27) is acceptable;

means for determining when information is sent over the first downlink (27); and

means for determining to execute the countermeasure, if information is sent over the first downlink (27) while the first downlink (27) is subject to a Rayleigh fading dip and the communication quality of the first downlink (27) is not acceptable.

48. An apparatus according to any one of the claims 33, 42 or 43, wherein the means for determining whether to execute the

countermeasure includes means for determining to execute the countermeasure, if it is determined that the first uplink (25) is subject to a Rayleigh fading dip.

49. An apparatus according any one of the claims 33, 42, 43 or 48, wherein the means for determining whether to execute the countermeasure includes means for determining to execute the countermeasure, if it is determined that the first downlink (27) is subject to a Rayleigh fading dip.

50. An apparatus according to any one of the claims 33 to 49, wherein the means for determining whether to execute a countermeasure includes means for determining whether to perform a handoff from the first radio channel (23).

51. An apparatus according claim 50, wherein the apparatus further comprises:

means for selecting a new channel to which handoff is to be performed, if it is determined to perform a handoff from the first radio channel (23); and

means for initiating the handoff from the first radio channel (23) to the new channel.

52. An apparatus according to claim 51, wherein the means for selecting includes:

means for determining a set of channels which are available for handoff; and

means for selecting the new channel from the set of channels.

53. An apparatus according to claim 52, wherein the means for determining the set of channels includes means for determining the set of channels to include at least one channel associated with the first radio base station (RBS1).

54. An apparatus according to any one of the claims 52 or 53, wherein the cellular radio communication system includes at least a second radio base station having essentially the same location as the first radio base station, and wherein the means for determining the set of channels includes means for determining the set of channels to include at least one channel associated with the second radio base station.

55. An apparatus according to any one of the claims 52, 53 or 54, wherein the means selecting the new channel from the set of channels includes means for selecting from the set of channels the channel having an uplink using a carrier frequency which differs the most from the carrier frequency of the first uplink (25) without being essentially an integer multiple of the carrier frequency of the first uplink (25), if the first uplink (25) is subject to a Rayleigh fading dip.

56. An apparatus according any one of the claims 52, 53 or 54, wherein the means for selecting the new channel from the set of channels includes means for selecting from the set of channels the channel having a downlink using a carrier frequency which differs the most from the carrier frequency of the first downlink (27) without being essentially an integer multiple of the carrier frequency of the first downlink (27), if the first downlink (27) is subject to a Rayleigh fading dip.

57. An apparatus according to any one of the claims 33 to 49, wherein the means for determining whether to execute a countermeasure includes means for determining whether to switch a transmitting antenna (11a,11b).

58. An apparatus for determining whether one of a first uplink (25) or first downlink (27) of a first radio channel (23) is subject to a Rayleigh fading dip, the first radio channel (23) being used during a current communication segment for

communications between a first radio base station (RBS1) and a first radio terminal (T1), the apparatus **characterised** in that it comprises:

means for obtaining a gain of the first uplink (25);

means for obtaining a gain of the first downlink (27); and

means for comparing the gain of the first uplink (25) to the gain of the first downlink (27) in order to deduce whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip.

59. An apparatus according to claim 58, wherein the means for comparing includes:

means for determining an offset (F) associated with a difference between the gain of the first uplink (25) and the gain of the first downlink (27) during the current communication segment; and

means for determining whether one of the first uplink (25) or the first downlink (27) is subject to a Rayleigh fading dip by monitoring how the difference between the gain of the first uplink (25) and the gain the first downlink (27) deviates from the offset (F).

60. An apparatus according to claim 59, wherein the means for determining the offset (F) includes means for determining the offset (F) by establishing an average value of the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during the current communication segment.

61. An apparatus according to claim 60, wherein the apparatus further comprises:

means for generating an initiation value for use as a starting point when establishing the average value in order to reduce a convergence time of the establishing of the average value.

62. An apparatus according to claim 61, wherein the means for generating of the initiation value includes means for generating the initiation value (F1) by averaging the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during all communications performed over the first radio channel (23) from a selected point in time which precedes the current communication segment.

63. An apparatus according to claim 61, wherein the means for generating of the initiation value includes means for generating the initiation value (F11) by averaging the difference between the gain of the first uplink (25) and the gain of the first downlink (27) during communications performed over the first radio channel (23) between the first radio base station (RBS1) and radio terminals of the same type as the first radio terminal (T1).

64. An apparatus according to any one of claims 59 to 63, wherein the means for monitoring includes:

means for determining that the first downlink (27) is subject to a Rayleigh fading dip, if the difference between the gain of the first uplink (25) and the gain of the first downlink (27) exceeds the offset (F) by more than a first predetermined value; and

means for determining that the first uplink (25) is subject to a Rayleigh fading dip, if the difference between the gain of the first uplink (25) and the gain of the first downlink (27) falls below the offset (F) by more than a second predetermined value.